DEPARTMENT OF THE NAVY

NAVAL FACILITIES ENGINEERING COMMAND

DRAFT FALL PROTECTION GUIDE/STANDARDS

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TABLE OF CONTENTS

SECTION # **PAGE #**

APPENDIX "A"

NAVAL FACILITIES ENGINEERING COMMAND

DRAFT FALL PROTECTION GUIDE/STANDARDS

1.0 INTRODUCTION

1.1 PURPOSE:

This Fall Protection Standard/Guide discusses the criteria for fall protection in the work place.

1.2 BACKGROUND:

Falls are the leading cause of injuries and fatalities in the work place. They are the second or third cause of injuries in general industry. It is a duty to provide fall protection to all workers exposed to fall hazards. Fall Protection is required to protect human assets, financial assets such as buildings and facilities, and physical assets such as machinery and equipment. Human asset is very expensive to retrain and to perform work efficiently. We cannot afford not to look at the human assets. It is extremely important to train, evaluate and help human assets to control the physical and financial assets.

1.3 APPLICATION:

This standard provides information for Engineering Field Divisions, Public Works Centers, Resident Officers In Charge of Construction, Seabee Designee, Safety Managers, Contractor's and Subcontractor's Personnel exposed to fall hazards.

1.4 SCOPE:

The scope of this guide is to develop a procedure designed to protect government workers and contractor's employees from falling off, onto, or through walking/working levels and to protect employees from being struck by falling objects. The guide identifies area of activities where fall protection is required. These include but not limited to ramps, runways and other walkways, excavations, hoist areas, holes, form-work and reinforcing steel, leading edge work, unprotected sides and edges, overhand bricklaying and related work, roofing work, pre-cast concrete erection, wall openings, maintenance and construction of communication towers, residential construction and other walking/working surfaces. COE, EM-385-1-1 and OSHA 1910 and 1926.500, Subpart M Standards sets a uniform threshold height of 6 feet (1.8) meters where protection from falls is required for all employees.

All regulations and standards for fall protection and health safety contain the minimum requirements. "DOD 6055.1" Instructions does not preclude DOD components from prescribing supplementary requirements for special conditions over which the DOD component itself, or in coordination with other Federal agencies, exercise statuary authority

for safety and health matters. Generally DOD Instructions 6055.1 does not apply to DOD contractors, except for inspection requirements.

1.5 REGULATIONS:

- US Army Corps of Engineers, Safety and Health Requirements Manual, EM 385-1-1, 3 SEPTEMBER 1996;
- OSHA 29 CFR, PART 1926 Subpart M Requirement, Fall Protection Requirement in the Construction Industry;
- OSHA 29 CFR, Part 1910 Occupational Safety and Health Standards;
- Department of Defense Directive 6055.1, Occupational Safety and Health Program;
- ANSI Z359.1 (1992) Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components;
- ANSI A10.14 (1991) Requirements for Safety Belts, Harnesses, Lanyards, and Lifelines for Construction and Demolition.

2.0 DEFINITIONS:

Anchorage: A secured structure that can safely withstands forces exerted by fall protection and rescue equipment. The structure can be in the form of a beam, girder, column or floor. Anchorage is either engineered or improvised. The anchorage must be capable of withstanding a minimum of $5,000 pounds per person.

Anchorage Connector: The means by which fall protection system is secured to the anchorage. This could be a steel cable sling, load rated eye-bolt, tripod, davit arm or any other device designed to suspend human loads and capable of withstanding the forces of a fall.

Arresting Force: The force exerted on a worker or test weight when a fall protection system stops a fall. The amount usually expresses the peak force experienced during a fall.

Body Belt: A strap with means both for securing it about the waist and attaching it to a lanyard, lifeline or deceleration device. (no longer used after 1 January 1998).

Body Harness: Means of configuration of connected straps to distribute fall arresting force over at least the upper thighs, waist, shoulders, chest and pelvis, with means for attaching a lanyard to other components of personnel fall arrest system.

Body Restraint System: A strap device, such as body belt chest harness or full body harness, that can be secured around a worker and attached to a load-bearing anchorage in order to restrict travel and limit the fall hazard. The strap can be single or multiple.

Buckle: Any device for holding the body belt or body harness closed around the worker's body.

Cable Grab: A fall arrest device that locks by either a cam lock (Locking arm) or inertia when a free fall is sensed. It is attached to a worker directly or by a lanyard that slides up or down a fixed cable or vertical cable lifeline.

Carabiner: An oblong ring snap-hook. Also a connector component generally comprised of an oval or trapezoidal shaped body with a closed gate or similar arrangement.

Competent Person (CP) for Fall Protection: A person who is capable of identifying hazardous or dangerous conditions in the personal fall arrest system or any component thereof, as well as in their application and use with related equipment (OSHA 1910.66 Appendix C). Note: The OSHA CP definition (1926.650 and 1926.32(f) also requires that a CP have the authority to take prompt corrective measures to eliminate the hazards (See Qualified person for design knowledge).

Connecting Means: A lanyard or a device used to connect a body support to an anchorage, so that it provides protected mobility for an elevated work task.

Controlled Access Zone (CAZ): Control line to restrict access to leading edge work. CAZ should run the full length of the leading edge and connect on each side to a guardrail or wall. The line is made of rope, wire or tape or equivalent material and shall be supported by posts and marked with a highly visible material.

Conventional Fall Protection Systems: Such as Guardrail systems, personal fall arrest devices, or safety nets

D-ring: A connector used integrally in a harness as an attachment element or fall arrest connection and in lanyards, energy absorbers, lifelines and anchorage connectors as an integral connector (ANSI Z359.1-1992).

Energy (Shock) Absorber: A component whose primary function is to dissipate energy and limit deceleration forces, which the system imposes on the body during fall arrest.

Fall Arrest System: A tested device and components that function together as a system to arrest a free fall and minimize the potential for compounding injury.

Fall Prevention: Any same-level means used to reasonably prevent exposure to an elevated fall hazard. Floors, walls, guardrails and area isolation are means of fall prevention.

Fall Protection: What is done to effectively address fall hazards.

Fall-Restraint System: Lanyard or device that is designed to restrain a worker in order to prevent a fall from occurring.

Horizontal Lifeline (HLL): A component consisting of a flexible line composed of a rail, rope, wire or synthetic cable installed horizontally and used for attachment of a worker's lanyard or lifeline device while

moving horizontally. It is used to control dangerous pendulum-like swing fall. HLL shall be designed, installed and used under the supervision of a qualified person, which maintain a safety factor of two.

Ladder Climbing (Safety) Device: A device or climbing sleeve connected to the front D-ring on the climber's full body harness that slides up and down a rigid rail or cable. Should the fall occur, the device is designed to lock by inertia or cam action to arrest the fall.

Lanyard: A flexible line or rope, wire rope, or strap used to secure the body belt or body harness to a deceleration device, lifeline, or anchorage.

Leading Edge: Unprotected side and edge, means the edge of a floor, roof or formwork for a floor or other walking/working surfaces.

Lifeline (LL): A component consisting of a flexible line for connection to an anchorage at on end, to hang vertically (vertical LL), or for connection to anchorage at both ends to stretch horizontally (HLL), and which serves as a mean for connecting other components of a personal fall arrest system to the anchorage.

Personal Fall Protection System: A system used to arrest an employee in a fall from a working level. It consists of an anchorage system, connecting means , body harness, and may include a lanyard, deceleration device, or lifeline.

Positioning Belt: A single or multiple straps that can be secured around a worker's body to hold the user in a work position.

Qualified Person (QP) for Fall Protection: A person with recognized degree or professional certificate and with extensive knowledge and experience in the subject field, who is capable of design, analysis, evaluation and specifications in the subject work, project, or product (OSHA 1910.66 Appendix C). Note: The OSHA QP definition (1926.32[1] has similar wording.

Retracting Lifeline: See Self-Retracting Lanyard definition.

Rollout: The process by which a snap-hook or carabiner unintentionally disengages from another connector or subject to which it is coupled.

Rope Grab: A fall arrester that is designed to move up or down a lifeline suspended from a fixed overhead anchorage point to which a worker's belt or harness is attached. The rope grab will lock onto the compatible rope.

Self-Retracting Lanyard (SRL): A deceleration device which contains a drum-wound line that may be slowly extracted from, or retracted onto, the drum under slight tension during normal worker movement, and which, after onset of a fall, automatically locks the drum and arrests the fall.

Shock Absorber: A component of a fall protection system that dissipates energy by creating or extending the deceleration distance.

Snap Hooks: A connector comprised of a hook-shaped body with a normally closed gate or similar arrangement which may be opened to permit the hook to receive an object and when released automatically, closes to retain the object. After 1 January 1998 only self locking snap hooks are accepted or used, (OSHA, 29 CFR 1926.500, Subpart M).

Swing fall: A pendulum-like motion that can result from moving horizontally away from a fixed anchorage and falling. Swing falls generate the same amount of energy as a fall through the same distance vertically but with additional hazard of colliding with an obstruction or the ground.

Toe-board: A low protective barrier that will prevent the fall of materials and equipment to lower levels.

Warning Line System: A barrier erected on a roof to warn workers that they are approaching an unprotected roof, side or edge and which designate an area which roofing work may take place without the use of guardrail, body harness or safety nets systems to protect workers in the area. Work outside barriers will require fall protection systems.

3.0 TRAINING REQUIREMENT

In accordance with 29 CFR 1926.503, every employer shall provide a training program for each employee who might be exposed to fall hazards.

3.1 The training program shall enable each employee to recognize the hazards of falling in the work place and how to minimize fall hazards.

3.2 Every employee shall be trained as necessary prior to start of work, by a competent person in the following areas:

- 3.2.1 Nature of fall hazards
- 3.2.2 Fall protection systems
- 3.2.3 Use and operations of fall protection/prevention systems
- 3.2.4 Inspection of fall protection equipment by the workers
- 3.2.5 Role of each employee in the safety monitoring systems
- 3.2.6 Handling, storage and maintenance of fall protection systems

3.3 Certification of training is required and shall be maintained at the job site for the duration of the work.

3.4 All contractors and subcontractor's personnel exposed to fall hazards shall be trained accordingly. It is highly recommended that daily tailgate meetings be conducted prior to start of work to discuss fall hazards for that day, and to remind workers to comply with the established fall protection procedures. Tailgate meetings will document the workers received ample training in fall protection.

3.5 All Navy personnel exposed to fall hazards shall be trained in accordance with paragraph 3.1 through 3.4 above and receive at a minimum 16 hours, or as appropriate, End User Training in fall protection.

3.6 Fall protection for investigations and inspection work is also required.

3.7 All Resident Officer In Charge of Construction ROICC personnel administering construction and maintenance contracts, shall receive at a minimum 8 hours Hands-on Training in the Fall Protection systems, procedures, and End User Training. The ROICCs shall be able to recognize any fall hazards, deficiencies and fall risks at a construction site.

3.8 At a minimum every Engineering Field Division, Public Works Center and Seabee Battalion shall appoint in writing an engineer to be trained in fall Protection as a qualified/competent person [40 hours, or as appropriate]. The candidate shall posses an engineering degree as a civil/structural and or mechanical and should be from the design department, and have construction knowledge. The candidate for fall protection engineer will be appointed in writing. The following are the anticipated duties of the appointed engineer:

- Design of fall protection systems, when required, including anchor systems, connecting means and body support;
- Prepare, update, review and approve fall protection plans and rescue and evacuation plans;
- Be the point of contact between the SOUTHWESTDIVISION fall protection engineer and his or her command or activity (EFDs, EFA, PWC and SEABE);
- Aid in the investigation and inspection of fall accidents and mishaps within the EFD, EFA and PWC footprints and prepare lessons learned reports on the accidents;
- Should be knowledgeable and proficient with all the regulations, fall protection products, equipment and systems,

4.0 INSTRUCTIONS:

The following instructions/guide are included to help Navy personnel identify fall hazards in the work place and identify the recommended fall protection systems to minimize the dangers of falls:

4.1 Identification of Fall Hazards in the Work Place:

4.1.1 Fall hazards more that six-foot
4.1.2 Fall Hazards - Above a hazard at any height (e.g. above debris, machinery, structures, reinforcing bars, liquids)
4.1.3 Open Sided - [ ] Floors [ ] Platforms [ ] Stairs [ ] Catwalks [ ] Scaffolds
[ ] Machinery [ ] Other

4.2 INSTRUCTIONS FOR USING FALL PROTECTION PLAN MATRIX

(See Fall Protection Work Plan Matrix in Appendix A)

4.2.1. Identify Fall Hazards in the Job Area

Read the first two items (1 & 2) and check the boxes that apply. If either statement is applicable, you must fill out the Fall Protection Plan;

4.2.1.1 Continue to read the information describing fall hazards and indicate the items that apply by placing a check mark in the appropriate box to the left of the reference number.
4.2.1.2 Use the reference number to find additional information in Appendix A.
4.2.1.3 If a hazard exists that is not listed, write it in the "Other" box.

4.3 "Description of Fall Arrest/Restraint Methods."

4.3.1 Select the method(s) to be used from those indicated by any open circle in the intersection between section (1) and (2) (Marked "A' at the corner). Fill in the circle to indicate the method(s) that will be used and place a check mark in the appropriate box to the left of the reference number.
4.3.2 An existing **X** in the boxes indicates a required item to be used.
4.3.3 Use the reference number to find additional information in the Appendix A.
4.3.4 If a method is chosen that is not listed, write it in the "Other" box.

4.4 Inspection and Instructions for Assembly/Disassembly and storage."

4.4.1 Fill in the open circle to indicate the item to be used from those recommended in the intersection between section (2) and (3), (Marked "**B"** at the corner). Place a check mark in the appropriate box to the left of the reference number.
4.4.2 An existing **"X"** in the boxes indicates a required item to be used.
4.4.3 Use the reference number to find additional information in Appendix "A."
4.4.4 If a method is chosen that is not listed, write it in the "Other" box.

4.5 "Warning Systems and Pass through Protection."

4.5.1 Fill in the open circle to indicate the items to be used from those recommended in the intersection between section (**4**) and (**1**) (marked "C" at the corner) then place a check mark in the appropriate box to the left of the reference number.
4.5.2 Hard hats **and** one other method to protect workers from falling objects must select from items: 35, 36, 39, 41, 42, 47 or an appropriate "Other" method.
4.5.3 An existing **"X"** indicates a required item to be used.
4.5.4 Use the reference number to find additional information in Appendix A.
4.5.5 If a method is chosen that is not listed, write it in the "Other" box.

5.0 Emergency Rescue Plan

Include the following information as part of Emergence rescue Plan

5.5.1 Detailed location of the work site with any information that will help to find the location; Bldg. No., Floor No.; etc.
5.5.2 Detailed location of a lift that may be required for rescue. Indicate how far is the lift from the work site.
5.5.3 Location of the nearest First Aid Kit.
5.5.4 In the event of an emergency rescue is required, call the phone numbers in the order that they are listed; 1st, - 2nd, -3rd. Give complete information to the rescue responder.
5.5.5 Send escort to help the fire department or the rescuer find the location of the incident.

5.1 EMERGENCY RESCUE PLAN Form

Site & Location Identification:

Detailed Location:

Primary Emergency Phone Number:

Type of Phone/Location:

Local Phone Line/Outside Line:

Secondary Emergency Phone Number:

Backup Rescue Lift is Available/Located at:

First Aid kit Location:

Nearest Hospital Route and Location:

Describe Rescue Operation:

Type of equipment (PPE, Ladder, Hoist, etc.)

Training on Rescue:

Name of Personnel Requiring Rescue:

Additional Comments: _____
_____
_____
_____
_____

6.0 Fall Protection Training Roster:

(Refer to section 6 of fall protection matrix)

- Before the start of a job, all workers exposed to fall hazards shall read and understand the Fall Protection Plan, and be trained in the proper use of fall protection equipment. New employee

on the job shall also sign the fall protection roster form prior to start work. All subcontractors workers exposed to fall hazard shall be trained accordingly.

- If additional fall hazard requirement arise or change at the job site as the work progresses, the Fall Protection Plan (FPP) shall be reviewed and updated by a Qualified Person, and signed again by all workers exposed to fall hazards.

6.1 FALL PROTECTION TRAINING ROSTER (FORM)

All employees signing this form shall indicate that they understand the fall hazards on the job site and they have been trained in the proper use of and will

use the selected fall protection equipment and methods. Review and sign again if hazards or methods change.

NAME: ____
ORGANIZATION/CODE/SHOP: _____________________________________
SIGNATURE: ____
TRAINING DATE(s): ____
DURATION OF TRAINING (Hrs): ______________________________________
INSTRUCTURE'S NAME: ____
COURCE TITLE: ____
DESCRIPTION OF THE COURCE: _____________________________________

NAME: ____
ORGANIZATION/CODE/SHOP: _____________________________________
SIGNATURE: ____
TRAINING DATE(s): ____
DURATION OF TRAINING (Hrs): ______________________________________
INSTRUCTURE'S NAME: ____
COURCE TITLE: ____
DESCRIPTION OF THE COURCE: _____________________________________

NAME: ____
ORGANIZATION/CODE/SHOP: _____________________________________
SIGNATURE: ____
TRAINING DATE(s): ____
DURATION OF TRAINING (Hrs): ______________________________________
INSTRUCTURE'S NAME: ____
COURCE TITLE: ____
DESCRIPTION OF THE COURCE: _____________________________________

NAME: ____
ORGANIZATION/CODE/SHOP: _____________________________________
SIGNATURE: ____
TRAINING DATE(s): ____
DURATION OF TRAINING (Hrs): ______________________________________
INSTRUCTURE'S NAME: ____
COURCE TITLE: ____
DESCRIPTION OF THE COURCE: _____________________________________

7.0 Fall Protection Applications/Solutions

7.1 Climbing Communication Towers:

7.1.1 **Towers Lower than 200 feet in height**:

- First worker up, requires Full body harness, portable anchorage, use SRL and rope grab
- After permanent anchorage secured in place, the following workers will require full body harness, SRL, vertical lifeline and rope grab
- All workers will require 100% fall protection at all times

7.1.2 Towers higher than 200 feet:

- Tower access to above 200 feet; workers can be hoisted using the gin Pole;
- 100% fall protection at all times;
- Maximum three (3) people can ride the gin pole at the same time to gain access to the tower above 200.

7.2 Climbing Ladders

- Use full body harness, rope grab, SRL's or vertical lifeline

7.3 Roof Work

- On slopped roofs use full body harness, SRL, brackets to be used as anchorage points (single or multiple connections designed for 5000 pounds per person), also use lifelines;
- On flat roofs use full body harness and SRL, establish 6 feet warning line system from the leading edge or temporary guard rail.

7.4 Leading Edge Work

- Horizontal lifeline, full body harness, SRL, or use Guardrail.

7.5 Scaffold Work

- Guardrails , cross bracing with full body harness and life lines

7.6 Lifting Equipment/Working Platforms and Elevators:

- Use full body harness, lanyards and vertical lifelines and guard-rails;
- Workers will require fall arrest system if the lifting equipment is positioned outside the wheel-base even if the equipment has guardrail system;
- When using scissors lift, workers will require fall restraining system tied to the guardrails.

7.7 Confined Space Entry:

- When entering a confined area and if there is a hazard of exposure to vertical fall, the person entering such space shall be tied to a lifeline and rescue and retrieval equipment, and a co-worker should be able to retrieve the victim utilizing the retrieval mechanism without any difficulty.

8.0 Duties and Responsibilities of Qualified and Competent Persons:

8.1 Qualified Person (QP):

- Prepare, Review, Approve and Modify:
  Fall Protection Plans
  Rescue and Evacuation Plans;
- Design, Select, Certify, Evaluate and Analyze Fall Protection Systems and Equipment;
- Review, prepare and approve Fall Protection Plans and Specifications;
- Prepare Contract Documents for Fall Protection Systems.

8.2 Competent Person (CP):

- Implementation of:
  Fall Protection Plans
  Rescue and Evacuation Plans;
- Identify Hazardous and Dangerous Conditions in the Work Place;
- Inspection and installation of approved fall protection systems ;
- Compliance with Fall protection Plans, Rescue and Evacuation Plans;
- Training of all |workers exposed to Fall Hazards;
- Understanding and Knowledge of Fall Protection Systems and Equipment;
- Conduct Inspection/Accident Investigation;
- Have full responsibility to implement the FPP/REP at work place;
- Have only one task, to monitor the employee compliance with FPP/REP.

9.0 Inspection, Maintenance, Storage and Care Procedures for Fall Protection Equipment:

As a general rule, always consult manufacturer's recommendations for Use, Inspection, Care and Maintenance .

9.1 Anchorage Systems:

- Inspect all components of the anchorage systems
- Observe any abrasions wear points, damaged threads or swags in the sling material before use.
- For synthetic slings, inspect all sewing and loops
- Refer to the anchorage attached tags to determine when the sling should be retired
- Inspect cable slings for excessive damage to the steel fibers

9.2 Snap-hooks and Carabiners:

- Inspect on regular basis and before each use;
- Retire snap-hooks and carabiners and all integral components, if any discoloration, deformation, cracks or abrasions are detected;
- Retire immediately if it has sustained any fall, the spring brakes, and the gate is bent or if the gate keeper no longer engages the slot cleanly;
- Damaged snap-hook and carabiners shall be tagged and removed from service and inventory list;

- Dirty snap-hooks and carabiners shall be cleaned with kerosene, WD-40 or similar solvent, immerse in boiling water for 30 seconds to remove cleaning agent and dry with soft cloth, insure gate and gatekeeper operate properly;
- Carabiners shall not be loaded along the gate side.

9.3 Lanyards and Energy Absorbers:

- Inspect lanyards regularly under slight tension
- Check all components for abrasion, discoloration, cracks, and torn stitching
- Wash on regular basis to remove dirt and grit that can abrade the fibers
- Lanyards and energy absorbers shall meet applicable regulations and marked as such and manufacturer's labels placed on them.
- Use and review manufacturer's log book provided with the equipment to determine the age of the lanyard and energy absorber
- Maximum usage of a lanyard shall not be more than 5 years; retire the lanyard**:**
    * After a hard fall
    * When the shock absorber has been even slightly impacted
    * If lanyard has been used for any other purpose other than fall protection

9.4 Fall Arrester

- Inspect regularly
- Check for signs of wear, corrosion, rust and other anomalies
- If any signs of wear or malfunction, remove devise from service

9.5 Self Retracting Lifelines (SRL):

- Inspect prior to each use;
- Inspected by a competent person regularly;
- SRL shall be returned to the manufacturer for servicing and re-certification once a Year;
- If the SRL housing becomes yellow, gathers condensation, or the indicator has been engaged remove from service immediately and return it to the manufacturer.

9.6 Body Support:

- Inspect on a daily basis for frayed threads, cuts, tears or loose connections;
- Inspect the stitched areas thoroughly;
- look for burn holes from welding or other heat sources;
- Ensure harnesses are not painted or marked;
- Store harnesses in a cool dry safe environment; ideally in a locked storage area;
- Competent person shall inspect the harness periodically;
- Wash the harness in a mild soap and rinse multiple times to remove any soap residue and hang to dry out of direct sunlight in a cool dry environment;
- Maintain a log book indicating the date of entry into service, the nature of the work Performed, washing or other details;
- Retire harness from service after 5 years.

9.7 Ropes:

- Inspect Rope periodically for broken fibers, severely worn areas or change in the consistency of the core, inspect under slight tension and check for soft areas, bulges or excessive stiffness;
- Avoid exposing rope to hazardous chemicals, moisture, acids or oils;
- Don't use the rope after it is impacted or damaged;
- Wash the rope, on regular basis to remove dirt or grit, with lukewarm water and mild detergent, rinse several times to remove soap residue and hang in a dry, cool, dark area;
- Store rope in a strong weather proof bag and should always be dry prior to storage;
- Retire rope after 5 years of service or if it is damaged, impacted or exposed to chemicals.

9.8 Vertical Lifelines:

- Refer to the rope section, and manufacturer's recommendations regarding inspection, care and maintenance.

9.9 Ladder Climbing Systems:

- Inspect on a regular basis;
- The sleeve should run freely without hand operations or guidance;
- Check cable and rails for abrasions, wear and cracks;
- before climbing check integrity of cable, systems and ground level.

9.10 Raising/Lowering Devices:

- Inspect visually before each use;
- Check for wear, and corrosion;
- Refer to the rope section for additional information.

10.0 Fall Protection Plan (FPP)/Rescue and Evacuation Plan (REP)

A qualified person shall prepare the FPP/ REP, he shall also approve any changes to the requirements or updates to the plans. The plans shall be kept at the site at all times with any changes noted. The fall protection plan shall include the following:

10.1 Descriptions of the fall hazards in the work place
10.2 Type of fall protection/fall prevention for every phase of the work
10.3 Training requirements for every employee exposed to fall hazards
10.4 The names of the qualified and competent persons shall be included in the plan
10.5 Type of fall protection equipment and systems provided to the employees exposed to fall hazards

10.6 In case of fall include rescue operations
10.7 Indicate fall protection equipment and instructions for assembly/disassembly, storage, maintenance and care
10.8 Description of warning requirements

11.0 American National Standard Institute (ANSI) Safety Requirements (Z359.1)

The ANSI Z359.11-1992 includes safety requirements for personal fall arrest systems, subsystems and components. The standard establishes requirements for the performance, design, markings, qualification, instruction, training, inspection use, maintenance and removal from service of connectors, full body harnesses, lanyards, energy absorbers, anchorage connectors, fall arresters, vertical lifelines and self-retracting lanyards comprising personal fall arrest systems for users within the capacity range of 130 to 310 pound weights. Above 310-pound weight of employee consult manufacturers.

The standard addresses personal fall arrest systems incorporating full body harnesses only. Body belts are not addressed as part of ANSI Z359.1.

12.0 Planning and Design Requirements:

In order to plan and design a safe fall protection program, the Navy personnel as well as the contractors and subcontractors shall be trained and have the knowledge, understanding and commitment to implement a comprehensive fall protection requirements for the safety of all employees exposed to fall hazards.

Planners and designers should be striving to achieve 100% fall protection for all employees exposed to fall hazards.

With regard to the order of control measures and solutions to fall hazards and project hierarchy and desirability, the planner and the designer should consider the following order of control measures and solutions when dealing with fall hazards (FH):

- **Elimination of FH**
- **Substitution and Replacement of FH**
- **Isolation and Separation of FH**
- **Engineering Controls**
- **Administrative Controls**

12.1 Design Requirements for Fall Protection:

(For other specific design criteria see other regulations and references), for additional information see Navy Guide Specification Section 01525 Safety Requirements.

*** <u>The following design information can be inserted into contracts or used by the in-house design group.</u>**

12.1.1 Fall Protection System Requirement

Each employee on a walking/working surface (horizontal and vertical) with unprotected side or edge which is 6 feet or more above a lower level shall be protected from falling by use of guard rail systems, safety nets or personal fall arrest systems. If working/walking near or above chemicals, liquids or obstructions, fall protection systems are required, even on same level exposure.

12.1.2 Guard Rails:

- 42 inches high plus or minus 3 inches above walking/working level
- sustain a stress of not less than 200 pounds
- Include top rail, mid-rails and toe boards

12.1.3 Stairs:

Stair-rails and Handrails:

- 36 - 37 inches (29 CFR 1926.500, Subpart M) for construction
- 30 -34 inches plus or minus 3 inches, (COE EM 385-1-1 and 29 CFR 1910)

12.1.4 Safety Nets:

- Minimum breaking strength of 5,000 pounds
- Safety net mesh opening cannot be larger than 36 square inches or longer than 6 inches on any side.
- Safety Nets must extend out from the working surface as follows;

Distance from working level to Net	**Distance Net should Extend from working surface**
Up to 5 feet	**8 feet**
Over 5 feet up to 10 feet	**10 feet**
Over 10 feet	**13 feet**

12.1.5 Personal Fall Arrest Systems:

- The system must withstand a minimum force of 5,000 pounds
- Free fall distance generally ranges between 4 - 6 feet.

12.1.5.1 Anchor Systems:

- Shall withstand a minimum force (breaking strength) of 5, 000 pounds;
- Many manufacturers require 5,400 pounds minimum anchorage strength for their equipment;
- No knots hall be tied in anchorage connectors

12.1.5.2 Snap-hooks and Carabiners

- Minimum Strength 5,000 pounds, must be self locking type

12.1.5.3 Lanyards

- Strength of 5,000 pounds
- Length: varies from 3 to 6 feet
- Synthetic rope lanyard minimum diameter is 1/2 inch
- Provide energy absorber with lanyards
- Dynamic performance test, maximum arresting force is 1,800 pounds
- No knots shall be tied in lanyards,

12.1.5.4 Ropes

- Synthetic rope lifelines minimum strength of 5,600 pounds
- Wire rope lifeline minimum strength of 6,000 pounds
- Vertical lifelines - 5,000 pounds

12.1.5.5 Energy Absorbers:

- Shall not elongate more than 42 inches
- Maximum arresting force 1,800 pounds, minimum operating force of 450 pounds

12.1.5.6 Self Retracting Lanyards;

- Withstand a minimum tensile load of 5,000 pounds if free fall distance is more than 2 feet
- Withstand a minimum tensile load of 3,000 pounds if the free fall distance is 2 feet and less
- Maximum arresting force shall not exceed 1,800 pounds

12.1.5.7 Full Body Harness:

- Maximum arresting force of 1,800 pounds
- Maximum lanyard length used 6 feet, lanyard length is not applicable if it includes energy absorber
- Maximum deceleration distance 42 inches

12.1.5.8 Warning Line:

- Six feet away from a leading **edge,** and flagged every 6 feet and provide signage indicating “warning line”.

Note: Horizontal lifelines are not addressed in the design requirements because they require different design for every specific application. The Horizontal lifeline has to be engineered with a safety factor of 2.

13.0 Construction Operations/Activities

13.1 Resident Officer In Charge of Construction (ROICC):

The ROICC shall ensure all construction contracts, prior to start of construction, includes specification sections dealing with fall protection, It should be the contractor's responsibility to provide fall protection to all employees exposed to fall hazards and properly trained. The contractor shall submit fall protection plan including training requirements for his employees and subcontractor's work force to the ROICC for review and approval. The ROICCs shall ensure that the contractor will not commence with any construction activities without approval of fall protection plan. **Fall protection should be one of the main topics discussed during the Pre-Construction meeting**.

13.2 In-house Design:

Navy designers shall ensure all design effort that requires fall protection, whether it is during construction phase or future maintenance phase, to have fall protection built into the design effort. The fall protection systems shall be permanently installed for future maintenance work.

13.3 Navy Design Managers:

The Navy Design Manages shall ensure that A/Es incorporate the requirements of the following:

- "Occupational Safety and Health Planning and Design Guide";
- Fall Protection is built into the design work and added to the specification sections of the contract;
- Utilize Automated Hazard Analysis system.

13.4 Maintenance Work:

The ROICCs and Navy Safety personal shall ensure that all maintenance contract work by contractors to include fall protection and to ensure the contractors comply with OSHA 1910 and 1926. The Navy maintenance Workers shall be trained on fall protection and to use of fall protection equipment when they are exposed to fall hazards

14.0 References:

- **CFR 1926.500, Subpart M, Fall Protection in the Construction Industry**

- **CFR 1910 - Occupational Safety and Health Standards**
- **US Department of Labor, OSHA 3124 1993 (Revised), Stairways and Ladders**
- **US Department of Labor, OSHA Instruction Standards, 3.1, December 1995, Interim Fall Protection Compliance Guidelines for Residential Construction**
- **American National Standard, ANSI Z359.1-1992, Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components**
- **Introduction to Fall Protection; J. Nigel Ellis, PHD., CSP, P.E., Second Edition by American Society of Safety Engineers**
- **Gravitec Systems Inc. Competent Person Training , Reference Manual, 1997**
- **Gravitec Systems Inc. Qualified Person Course Manual , 1997**
- **Boeing Co., Seattle WA, Fall Protection Plan**

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